DEQ INTEROFFICE MEMORANDUM

TO: TAMERA THOMPSON, APS

FROM: MIKE KISS, ODA

SUBJECT: SO_2 AIR QUALITY ANALYSIS OF MIRANT – POTOMAC RIVER GENERATING STATION CONDUCTED IN SUPPORT OF SAPCB STATE OPERATING PERMIT

DATE: 04/19/2007

CC: JAMES SYDNOR, TOM BALLOU

1 INTRODUCTION

Mirant Potomac River, LLC (Mirant) submitted a modeling analysis on April 18, 2007 pursuant to a request from the Department of Environmental Quality (DEQ) to assess compliance with the National Ambient Air Quality Standards for sulfur dioxide (SO_2). The analysis was requested by DEQ, under the direction of the State Air Pollution Control Board (SAPCB) to support a State Operating Permit (SOP) for SO_2.

This analysis represents an interim assessment of SO_2 air quality impacts from the facility based on the best available information at the time of this proposed permit action. Further refinements to the air quality analysis may be required in the future based on the resolution of modeling issues being discussed as part of a comprehensive NAAQS compliance demonstration described in the document entitled "Protocol for Modeling Ambient Pollutant Concentrations from the Proposed Stack Merge Project at the Potomac River Power Plant" (February 2007).

In August 2005 Mirant performed modeling of the existing facility's stacks. This modeling was documented in a report entitled "A Dispersion Modeling Analysis of Downwash from Mirant's Potomac River Power Plant." This previous modeling was performed in accordance with a protocol approved by DEQ. These analyses are provided as an attachment to the aforementioned February 2007 modeling protocol (Appendix 1 of this report).

There are only a few differences between the August 2005 modeling and that were proposed by the applicant for this permit action. These differences are summarized below and are described in greater detail throughout this report:

- Use of EPA-approved Equivalent Building Dimensions (EBD) derived in a wind tunnel study instead of building dimensions calculated by EPA's default BPIP-PRIME algorithm;

- Modeling several different operating scenarios to derive a set of complying SO_2 emission rates in pounds of SO_2 per million British Thermal Units (MMBTU), pounds per hour, pounds per day and tons per year; and

- Update of the 5 year meteorological database to 2002 – 2006.

It is important to note that DEQ's preliminary review of these results revealed that the most current version of AERMOD was not used by the applicant. As a result, DEQ has requested that Mirant revise the modeling during the 30-day public comment period to reflect use of the current model version. Additionally, DEQ has requested an analysis using 2001 meteorology which was determined to be the most critical year in the 2005 downwash study.

2 FACILITY DESCRIPTION

The Potomac River Generating Station (PRGS) consists of five bituminous coal-fired electric utility steam generating units. Units #1 and #2 each generate approximately 88 megawatts of electricity. Units #3, #4 and #5 each generate approximately 102 megawatts. The facility is located in Alexandria, VA, approximately 1 mile south of Reagan National Airport. Figure 2-1 depicts the site location.

3 BASIS FOR SO_2 NAAQS COMPLIANCE

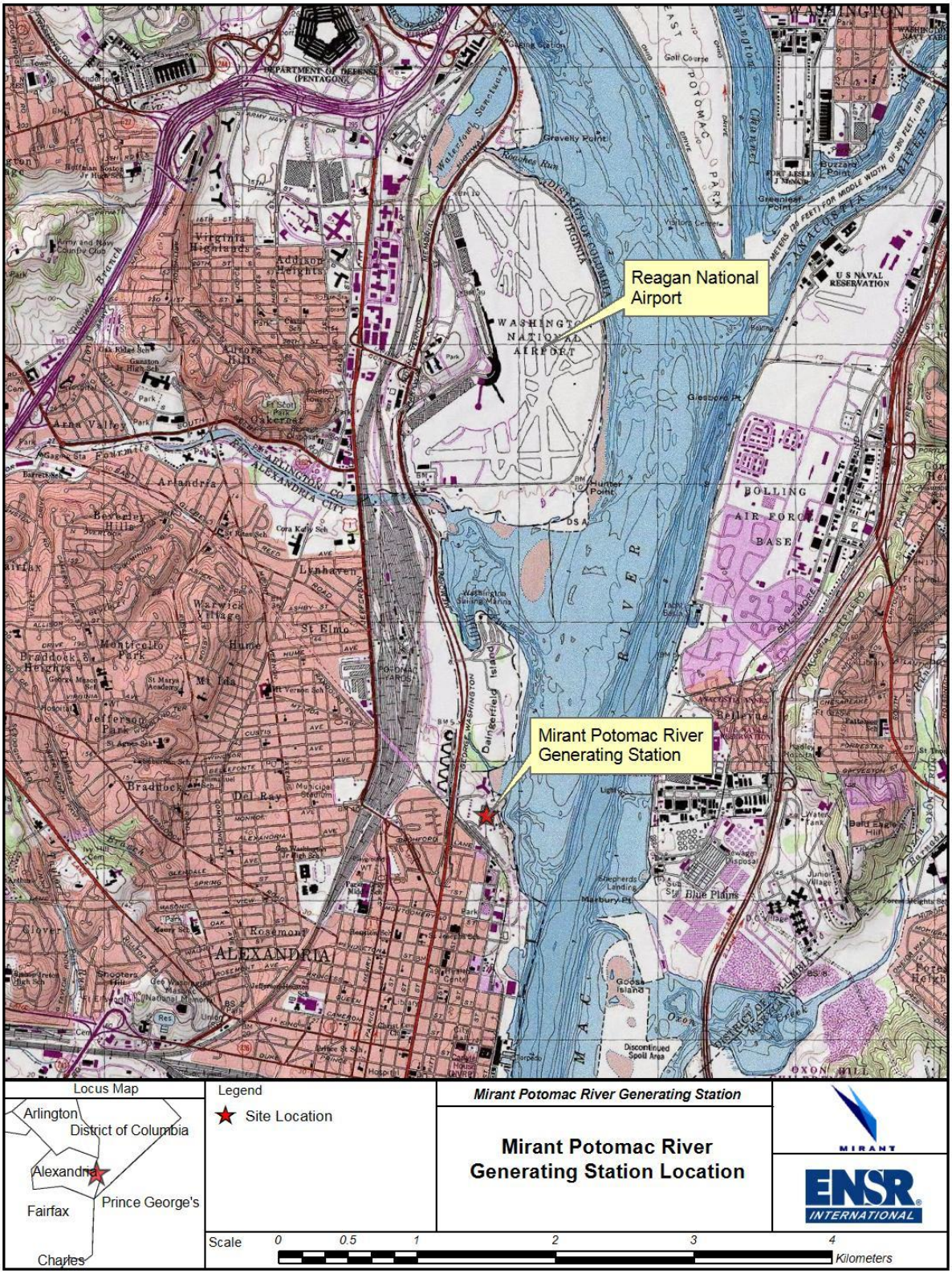
Modeled concentrations of SO_2 were added to a monitored background concentration (Section 4) and the total was compared to the NAAQS shown in Table 3-1.

Table 3-1: SO_2 National Ambient Air Quality Standards

Pollutant	Averaging Period	Primary NAAQS ($\mu g/m^3$)	Secondary NAAQS ($\mu g/m^3$)
SO_2	Annual(1)	80	None
	24-hour(2)	365	None
	3-hour(2)	None	1,300

(1) Not to be exceeded
(2) Not to be exceeded more than once per year

Figure 2-1: Mirant PRGS Location



4 BACKGROUND AIR QUALITY

Ambient air quality data are used to represent the contribution to total ambient air pollutant concentrations from non-modeled sources. Table 4-1 shows location and the measured concentration over the past three years (2004-2006) of the closest air pollution monitor to the Mirant power plant. Background concentrations of SO_2 for this assessment were based on the Alexandria City, VA air quality monitoring station data located 1 km to the SW of the power plant.

Table 4-1: Summary of the Background Air Quality Data

Pollutant	Monitor Site	Averaging Period	Measured Concentrations ($\mu g/m^3$)*			NAAQS ($\mu g/m^3$)
			2004	2005	2006	
SO_2	517 N Saint Asaph St, Alexandria City, VA	3-hour	141.5	175.5*	120.5	1300
		24-hour	55.0*	49.8	44.5	365
		Annual	15.7*	13.1	7.9	80
*Short-term concentrations reported as highest of the second highest and annual concentrations reported as mean.						

5 STACK PARAMETERS

Table 5-1 presents stack parameters used in the dispersion modeling:

Table 5-1: Point Source Stack Parameters

Units 1, 2, 3, 4, 5 at Maximum Load						
Unit #	Stack Height (m)	Heat Input (MMBTU/hr)	Capacity Factor	Temp (K)	Velocity (m/s)	Diameter (m)
Unit 1	48.158	1053	88	444.3	35.7	2.6
Unit 2	48.158	1029	88	455.4	30.2	2.6
Unit 3	48.158	1018	107	405.4	30.8	2.4
Unit 4	48.158	1087	107	405.4	33.2	2.4
Unit 5	48.158	1107	107	405.4	33.8	2.4
Units 1, 2, 3, 4, 5 at Minimum Load						
Unit #	Stack Height (m)	Heat Rate (MMBTU/MWh)	Capacity Factor	Temp (K)	Velocity (m/s)	Diameter (m)
Unit 1	48.158	14	35	442.6	19.0	2.6
Unit 2	48.158	13.4	35	431.5	18.7	2.6
Unit 3	48.158	10.8	35	413.2	15.3	2.4
Unit 4	48.158	11.3	35	411.3	15.1	2.4
Unit 5	48.158	11.3	35	406.0	13.9	2.4

6 MODEL SELECTION

The AERMOD modeling system was selected as the appropriate system to evaluate the impacts from the proposed Facility on the local terrain. AERMOD incorporates air

dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain.

The analyses presented in this report were conducted by Mirant using AERMOD Version 04300 which is consistent with prior modeling conducted for this facility. However, DEQ has requested that Mirant resubmit these analyses during the 30-day public comment period for this permit action using the most recent version of AERMOD that was recently released (Version 07026).

7 USE OF EQUIVALENT BUILDING DIMENSIONS

Mirant suspected that there was plume rise enhancement when winds transported stack gas effluent toward Marina Towers and that this was not being simulated in the August 2005 AERMOD modeling. Mirant also suspected that the complex interaction between the Mirant boiler building and Marina Towers could not be accounted for in EPA's BPIP-PRIME program. Finally, Mirant also suspected that AERMOD was not accurately simulating dispersion at ground level locations within a few hundred meters of the facility's stacks.

Mirant contracted with CPP, Inc., wind engineering and air quality consultants of Fort Collins, CO, to perform a wind tunnel study. The purpose of the Study was to refine the AERMOD default model by identifying EBD for use in AERMOD. The use of an EBD approach in a wind tunnel provides the appropriate link between the complex flow that can be modeled in the wind tunnel and the equivalent buildings that AERMOD can simulate.

The wind tunnel modeling is described in CPP's report entitled, "Wind Tunnel Modeling Evaluation for the Mirant Potomac Generating Station" (August, 2006). The wind tunnel study produced a separate set of EBD for modeling receptors at ground level than those used for Marina Towers. Therefore, modeling runs were split into two sets to accommodate the varying EBD inputs.

EPA approved the use of these EBD in future modeling of the facility in a letter dated March 21, 2007.

8 TERRAIN AND RECEPTOR DATA

The modeling analysis for this permit action was conducted out to 5 kilometers. The receptor grid to be used in AERMOD will be chosen from the USGS maps in accordance with standard EPA procedures. Fenceline receptors were established at 50-meter spacing along the property boundary, surrounded by discrete Cartesian receptors placed out to:

- 0 - 1 km with 100-meter spacing
- 1 - 3 km with 250-meter spacing

- 3 - 5 km with 500-meter spacing

Multi-story residential buildings located within approximately 1-2 km from the facility were modeled with flagpole receptors. Table 7-1 presents these buildings.

Table 7-1 Multi-Story Buildings Parameters (Used for Flagpole Receptors)

Multi-Story Building	UTM-X (m)	UTM-Y (m)	# of Stories	Building Height (m)	Story Height (m)
Alexandria House	322630.38	4297725.55	22	64.9	3.0
Carlyle Towers	320703.66	4296828.68	20	46.0	2.3
Carydale East	319579.69	4297276.05	18	48.3	2.7
Port Royal Condo	322652.21	4297815.58	17	46.1	2.7
Braddok Place [5]	321792.71	4298023.30	10	29.9	3.0
The Calvert Apartment	321128.13	4300123.85	15	42.7	2.8
Portals of Alexandria	320730.05	4301226.85	14	44.8	3.2
Marina Towers	322741.09	4298831.15	14	39.6	2.8

9 DERIVATION OF COMPLYING SO2 EMISSION RATES FOR SEVERAL OPERATING SCENARIOS

Complying SO_2 emission rates for several operating scenarios were developed in pound per million BTU, pounds per hour, pounds per day and tons per year. These rates were calculated based on the highest-second-highest 3-hour and 24-hour plant impacts as well as the highest annual average impact. The monitored background concentrations provided in Section 4 of this report were added to the impacts to produce will be that emission rate that produces a total impact (plant plus monitored background) that is in compliance with the applicable NAAQS.

10 METEOROLOGICAL DATA

For this application, five years of meteorological data were used for input to AERMET, the meteorological preprocessor for AERMOD. Hourly surface meteorological data from the NWS Station at Reagan National Airport, Virginia was used in addition to the upper air meteorological data from the NWS meteorological station at Sterling, Virginia to develop the 5-year (2002-2006) AERMET data files.

As previously mentioned, DEQ has requested that Mirant submit an analysis of 2001 data during the public comment period. 2001 was determined to be the most critical year based on the results of the 2005 downwash study.

11 SUMMARY OF MODELING RESULTS

SO_2 emissions from the facility have been evaluated and a summary of the complying emission rates for a variety of operating scenarios are presented in Appendix 2. The full modeling analysis and results, including electronic input and output files are also provided in Appendix 2.

It is important to note that the minimum complying SO_2 annual emissions rate for the facility (4158 tons per year) is estimated to be higher than the rate achievable based on multiplying the maximum pounds per day rate (20892) by 365 days which equals 3813 tons per year. It was assumed in the permit that the NAAQS compliant potential-to-emit (PTE) was equivalent to 3813 tons per year.

Appendix 1

Appendix 2